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Editorial

COVID-19 and the global OHCA crisis: An urgent need for system level solutions

In this edition of Resuscitation, two systematic reviews[1,2] and a national Spanish cohort study[3] highlight the alarming impact of the COVID-19 pandemic on the management and outcomes of out-of-hospital cardiac arrest (OHCA). The rapidly increasing literature in this area is highlighted by the difference in the number of identified studies between the two systematic reviews, despite only a small difference in search dates. Compared with historical data, these papers consistently show that during the COVID-19 period there were more cardiac arrests in the home, ambulance response time increased, and a marked decrease in patient survival. In contrast to data included in the two systematic reviews, OHCA incidence in Spain actually decreased although this is likely explained by differences in system response. The net result is a significant excess OHCA mortality during the COVID-19 period.

Studies to date provide important information as to what has happened during the peak of COVID-19, and should drive others to explore changes in their own system. The findings do, however, raise three critical questions for clinicians, public health and policy makers:

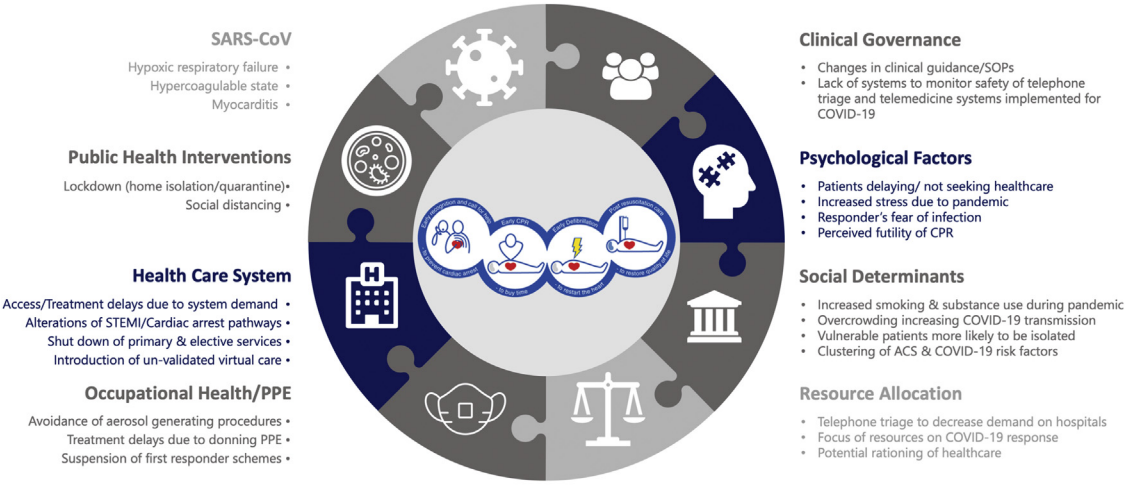
1) Which factors drive the increase in OHCA incidence and mortality during pandemic periods?
2) What actions are needed to limit the medium- and long-term impact of COVID-19 on OHCA, particularly as cases fall and lockdown measures decrease?
3) What actions are needed to limit the impact on OHCA in future waves of the COVID-19 pandemic or future pandemics?

COVID-19 has directly impacted on each link in the cardiac arrest chain of survival.[4] However, the mechanisms that have led to this impact reflect the direct effects of COVID-19, the indirect effects of COVID-19 and the wider societal context.[5] In the context of OHCA, these causal pathways are inevitably complex and our understanding is very limited. In Fig. 1, we present broader system factors that may influence these causal pathways. Improving our understanding of these factors will require our OHCA data collection to move beyond the standard Utstein dataset.[6] In the remainder of this editorial, we highlight some of the key data needed to help us better understand these causal pathways.

The direct contribution of COVID-19 infections on excess OHCA incidence and mortality is uncertain. Studies to date suggest less than one-third of this excess can be explained by individuals with known or presumed COVID-19 infection.[7,8] However, these data likely under-report the true effect due to narrow Public Health case definitions, compared with the diverse symptoms with which patients commonly present.[9] Comprehensive laboratory testing of patients for SARS-CoV, in particular those where resuscitation efforts are either not initiated or terminated in the field, would support our understanding of the extent of the direct effect of COVID-19 on OHCA. In view of the challenges associated with any additional burden on COVID-19 testing capability and potential issues associated with false-negatives, indirect epidemiological evidence that explores whether OHCA incidence and mortality is associated with factors such as COVID-19 case numbers and system changes (e.g. lockdowns) would also be informative.

In patients infected with COVID-19, improved understanding of OHCA pathophysiology may inform potential mitigations and the clinical management of OHCA. In some patients, the OHCA may be precipitated by hypoxic respiratory failure.[9] This might also explain, in part, the lower rate of shockable rhythms documented in the pandemic OHCA cohorts[1,2] and may also have implications regarding the utility of providing 'hands only' bystander CPR in these patients. Additionally, SARS-CoV infection has also been documented to cause myocarditis,[10] arrythmias,[11] and a hyper-coagulable state leading to thrombotic events including cerebral vascular accidents.[12,13] The degree to which these factors may be causing OHCA can only be determined by conducting and reporting post-mortem findings on these patients as well as collecting and analysing data on patient's symptoms and clinical course prior to their cardiac arrest. To date, there have been few studies of post-mortems on COVID-19 patients and none specifically on OHCA patients.[14] Similarly, several of the studies on OCHA during COVID-19 reported as limitations the lack of availability of clinical data beyond the standard Utstein template.[6]

Across many healthcare systems, health and social care services were reconfigured in response to the pandemic. These changes included reducing access to preventive care across both primary and secondary care, and cancellation of elective operations. In addition, clinical pathways were redesigned to support telemedicine and limit face-to-face direct contact between healthcare providers and patients, except where deemed essential.[15,16] Guidelines were also changed for dispatchers and responders regarding ambulance dispatch and patient transport decisions. Prior to COVID-19, there was increasing evidence that OHCA patients often accessed healthcare services in the period preceding their cardiac arrest.[17–19] In view of the uncertain impact of healthcare system changes in response to COVID-19 and potential risks of under-triage or over-



ACS (Acute Coronary Syndrome), COVID-19 (Coronavirus disease 2019), CPR (Cardiopulmonary Resuscitation), OHCA (Out of Hospital Cardiac Arrest), SOP (Standard Operating Procedure), STEMI (ST Elevation Myocardial Infarction)

Fig. 1 – Systems level factors related to OHCA incidence and mortality during the COVID-19 pandemic.

triage when assessing patients over the telephone, there is a need to understand how frequently OHCA patients contacted the health care system prior to their arrest, the associated clinical advice, and the extent to whether this advice was impacted by changes in response to COVID-19.

Clinical concern regarding the risk of transmission of COVID-19 infection risk to the bystander drove modifications to changes in cardiac arrest clinical guidelines and the personal protective equipment (PPE) worn by pre-hospital responders and dispatchers.[20–22] The requirement to wear this PPE was identified as leading to potential delays in both the dispatch process as well as the medical response.[2] This concern may also have contributed to reduced incidence of bystander CPR.[23] While important to protect clinicians from the additional risk potentially associated with treating an infectious patient in cardiac arrest,[24] much uncertainty remains regarding the specific risk associated with various treatments and interventions delivered during a resuscitation[25] and in particular the most appropriate mitigation strategies for use in the pre-hospital setting. Further research is warranted to inform the requirements and design of PPE for use in the pre-hospital setting.

Understanding the causal factors associated with the excess OHCA incidence and mortality during the pandemic will inform strategies to limit the effect of future pandemic waves. Internationally, we have tended to focus on the obvious cases of COVID-19 presenting to hospitals, often in overwhelming numbers. Stepping back to take a broader system view will ensure that we do not miss other potential opportunities to save lives. The consistent evidence across multiple healthcare systems in relation to OHCA is a red flag, that highlights the need for a coordinated response.

Many countries are now entering a second wave of COVID-19. We must use this opportunity to move away from siloed care delivery to ensure a co-ordinated system-wide (pre-hospital care, hospital care, primary care, public health) response to OHCA.

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Conflict of interest

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